

CLAIMS

WHAT IS CLAIMED IS:

1. A method for classifying an occupant including the steps of:
 - a. capturing an image of a plurality of occupant areas;
 - b. dividing the image into a plurality of subimages of predetermined spatial regions;
 - c. generating a spatial feature matrix of the image based upon the plurality of subimages;
 - d. analyzing the spatial feature matrix; and
 - e. classifying a plurality of occupants in the occupant areas based upon said step d).
2. The method of claim 1 further including the step of processing the image to account for lighting and motion before said step d).
3. The method of claim 1 further including the step of smoothing the classification of the occupant over time.
4. The method of claim 1 further including the step of determining whether to activate an active restraint based upon the classification of said step e).
5. The method of claim 1 wherein said step d) further includes the step of applying expert classifier algorithm to the spatial feature matrix.
6. The method of claim 5 wherein said step d) further includes the step of analyzing the spatial feature matrix based upon a set of training data.

7. The method of claim 6 further including the step of creating the set of training data by capturing a plurality of images of known occupant classifications of the occupant area.

8. The method of claim 5 wherein the expert classifier algorithm includes a neural network.

9. The method of claim 1 wherein the plurality of subimages overlap one another.

10. A vehicle occupant classification system comprising:
an image sensor for capturing an image of a plurality of occupant areas; and
a processor dividing the image into a plurality of subimages, the processor analyzing the subimages to determine a classification of the occupants in each of the plurality of occupant areas.

11. The vehicle occupant classification system of claim 10 wherein the processor determines the classification of the occupant from among the classifications including: adult, child and infant seat.

12. The vehicle occupant classification system of claim 11 wherein the processor determines the classification of the occupant from among the classifications including: adult, child, forward-facing infant seat and rearward-facing infant seat.

13. The vehicle occupant classification system of claim 10 wherein the processor generates a spatial feature matrix based upon the plurality of subimages.

14. The vehicle occupant classification system of claim 13 further including at least one filter generating the spatial feature matrix based upon the plurality of subimages.

15. The vehicle occupant classification system of claim 14 further including an image processor for altering the image based upon lighting conditions and based upon motion.

16. The vehicle occupant classification system of claim 15 wherein the processor analyzes the spatial feature matrix to determine the occupant classification using a neural network.

17. The vehicle occupant classification system of claim 10 further including a temporal smoothing filter applying a decaying weighting function to a plurality of previous occupant classifications to determine a present occupant classification.

18. The vehicle occupant classification system of claim 17 further including a confidence weighting function applied to the plurality of previous occupant classifications to determine the present occupant classification.

19. The vehicle occupant classification system of claim 10 further including a plurality of digital filters extracting low-level descriptors from each of the subimages, the processor analyzing the low-level descriptors to determine the classification of the occupant.

20. A method for classifying an occupant including the steps of:

- a. capturing an image of a plurality of occupant areas;
- b. dividing the image into a plurality of subimages of predetermined spatial regions;
- c. generating a plurality of low-level descriptors from each of the plurality of subimages;
- d. analyzing the low-level descriptors; and
- e. classifying an occupant in each of the plurality of occupant areas based upon step d).

21. The method of claim 20 wherein said step d) further includes the step of analyzing the low-level descriptors based upon a set of training data.

22. The method of claim 21 further including the step of creating the set of training data by capturing a plurality of images of known occupant classifications of the occupant area.

23. The method of claim 20 wherein said steps d) and e) are performed using a neural network.

24. The method of claim 20 wherein said step d) is based upon system parameters including an orientation or a location from which the image is captured relative to the occupant area.